RTP Circuit Breaker over LTE network

Zaheduzzaman Sarker
Ericsson Research
IETF88, Vancouver, Canada
Agenda

- Short introduction to Circuit Breaker
- Test scenario
- Evaluation
- Conclusion
Circuit Breaker (CB)


• Defines minimum set of RTP “Circuit breaker”
  – To stop RTP transmission to protect the network from excessive congestion

• Three triggers
  – Media Timeout
  – RTCP timeout
  – Congestion
SIMULATION SCENARIO

- Downlink simulation
- 7 base station*3 cells
- 3GPP case 1 SIMO
- Spectrum: 5MHz
- User arrival described through Poisson process
- AQM on
- Video only
- Video: Nominal bitrate 1500kbps
  - 30fps
  - Non-rate adaptive
- Video length 30 seconds

RTCP timeout will not happen as this is downlink only simulation.
Media quality (without CB)

CDF of average video frame delays

CDF of 98 percentile video frame delays

CDF of avg. video frame delay

CDF of 98 %tile of video frame delay
Media quality (Without CB)

Media quality is very poor in high and extreme load
Did CB triggered?

- Yes
- Triggers
  - Media timeout? NO
  - Congestion? YES
Media quality (CB enabled)

CDF of Packet Loss Rate at RTP level

- Moderate load
- High load
- Extreme load

Small amount of improvement
• CDF of PLR in CB triggered user shows the loss was very high
  – Highly unlikely any of those were false trigger
• PLR in non CB triggered user also shows high losses
  – Some of them should have triggered CB
Example user - Loss pattern

NO media timeout possibility
Low RTT resulting in high TCP throughput estimation
CB with complex TCP throughput equation (RFC 5348)

- Increases % of circuit breaker triggered users
PLR (complex TCP X_Bps equation)

Circuit breaker becomes more sensitive
Conclusion

• We need to compliment triggers to address the effect of AQM
  • Low RTT but high loss rate
  › It is unlikely that media timeout will occur for consecutive 2 RTCP interval with RTP AVP in LTE network.
    › Limited burst length of packet loss in LTE network
  › Use of complex TCP throughput equation makes the current congestion circuit breaker more sensitive
Next Steps

• Modify current proposal of circuit breaker triggers
  – Scaling RTCP interval
  – Use different order of magnitude than 10xTCP throughput to trigger congestion circuit breaker.

• Consider additional circuit breakers
  – High loss
  – High RTT